

In so far as there is any positive declaration to be found in the volume the authors may be classified with the "mutationists." They are at great pains, in fact, to define their precise position as members of that school "of which Bateson, de Vries, Kellog, and T. H. Morgan appear to be adherents" (p. 26). They state further that, "like Darwin," they "welcome all factors which appear to be capable of effecting evolution" (p. 27). What these factors are beyond natural selection (to which they assign some value) it is not quite easy to gather from the present work. Isolation, correlation, variation, and heredity have been considered very seriously by all evolutionists from Darwin down to the present time, and it cannot be said that Messrs. Dewar and Finn have shed any new light on these subjects. They tell us (p. 387) that species are made by

"the inherent properties of protoplasm and the laws of variation and heredity. These determine the nature of the organism; natural selection and the like factors merely decide for each particular organism whether it shall survive and give rise to a species."

This will seem to the reader who is not a "mutationist" to be very like pure Darwinism with a dash of "inherent properties of protoplasm" thrown in. The introduction of "biological molecules," which are defined (pp. 157-9) as the units of which the germ cell is composed, may be considered as the substitution of a vague conception for the very definite mechanism which has been introduced into the theories of heredity associated with the names of Darwin, Herbert Spencer, Weismann, Mendel, and others. One example of the use of this conception will suffice to show its vagueness:—

"Thus the phenomena of 'mimicry' and 'reversion' are, we believe, due to the fact that in the fertilised egg of both the pattern and its copy a similar arrangement of biological molecules obtains. If we regard the sexual act as resembling in many respects a chemical synthesis, the phenomenon need not surprise us" (p. 293).

The reasons for associating mimicry with reversion and sexual reproduction are not very obvious, even from the authors' own point of view. Dealing with the first set of phenomena only, if the "explanation" means that in a mimic and its model the similarity of colour and pattern is due to an identity either of physical structure or chemical constitution, or of both, it is untrue in fact. If it means that the resemblance has arisen because the units (*i.e.* "biological molecules") of which the ovum is in each case composed give rise to a similarity of colour and pattern on development, this appears to be a mere paraphrase of the description of the facts and no explanation at all.

It is to be regretted that Messrs. Dewar and Finn have made this aggressive incursion into the domain of biological theory. They are favourably known as popular writers on Indian ornithology and other natural-history subjects. Although in the present volume none of the objections brought against natural selection are new in principle, it must be placed to the credit of the authors that, unlike so many of the earlier critics of Darwin's work, they are able to give

a certain number of illustrations derived from personal observation and experience. But the work as a whole will not add to their reputation; with the majority of readers it will probably have the reverse effect. If the general object of the book is simply to emphasise the point that the theory given to science by Darwin and Wallace need not arrest further research in the domain of bionomics, there will be a very general unanimity among workers of all schools as to the soundness of their contention. But if the authors attribute any neglect, real or imaginary, of the study of bionomics to the direct influence of the teachings of Darwin and Wallace and their followers, they are inverting the truth. No greater stimulus was ever given to research in this domain than that given by the theory of natural selection. Any neglect with which English biologists can be charged is due to their ignoring and not to their acceptance of the teachings of the founders of that theory.

R. MELDOLA.

THE GEOGRAPHICAL DISTRIBUTION OF LEPIDOPTERA.

Die geographische Verbreitung der Schmetterlinge. By Dr. Arnold Pagenstecher. Pp ix+451. (Jena: G. Fischer, 1909.) Price 11 marks.

THE author of this work is one of the older German entomologists, who has been working for many years in the formation of a collection of Lepidoptera, and has published many valuable lists and monographs of the species found in various limited regions. He has now utilised his materials in a work which cannot fail to be interesting, not only to entomologists, but also to all naturalists who direct their attention to the numerous problems connected with the present geographical distribution of animals over the surface of the globe.

Dr. Pagenstecher remarks that the geographical distribution of Lepidoptera, like that of plants, is closely connected with certain physical and organic factors. The most important physical factors are (1) soil; (2) temperature and light; (3) moisture; (4) atmospheric conditions. The first portion of this work is therefore devoted to general observations on the geographical conditions of the continents, and the influence of mountains, desert or fruitful plains, the neighbourhood of rivers and seas, continental and oceanic islands, &c., on distribution. The influence of temperature, moisture, atmosphere, &c., is then briefly described; then vegetation, carnivorous habits, commensalism, &c. This is followed by sections on the distribution of Lepidoptera as affected by altitude, notes on migration, cosmopolitan species, and season-dimorphism and local variation. After this, the organic (physiological) factors of the subject are discussed, with special reference to former geological and climatic conditions, and some reference to fossil Lepidoptera. After some remarks on structure, and on the enemies of Lepidoptera, the section concludes with a summary of the Macro-lepidoptera of Central Europe (1626 species, according to Lampert), and a table of the species of *Papilio* found in the more important districts of the world.

The second section of the work is devoted to the

regions and subregions of the world as defined by Wallace, Sclater, and others, with some reference to the views of other zoologists and botanists on the subject. After this, the various regions and districts of the world are discussed, first with regard to their climatic conditions, and secondly with reference to the species of Lepidoptera known to inhabit them, of which, in many instances, very full lists are given. This portion of the work contains an enormous amount of valuable detail, and much scattered information is brought together which it would be very difficult to utilise in its original form. This portion of the work is the most extensive, but cannot here be discussed in detail.

The concluding section deals with the geographical distribution of Lepidoptera under their families and genera, and this also is very completely set forth. The book is illustrated by two outline maps, one (facing p. 62) indicating the regions and subregions of the world, as mapped out by Wallace and Sclater, and the other (facing p. 217) representing the Malay Archipelago from the Nicobars and Malacca to the Philippines, New Guinea, and North Australia.

Dr. Pagenstecher has not indulged in much theorising, but his book forms a great quarry from which philosophical speculators will be able to extract a vast amount of material. It is not a book that either systematic lepidopterists or philosophical naturalists can afford to ignore, and they will have reason to be very grateful to the author for the conscientious care that he has devoted to this most laborious and useful book.

W. F. K.

AGRICULTURAL FERTILISERS.

Fertilisers and Manures. By A. D. Hall, F.R.S. Pp. xvi+384. (London: John Murray, 1909.) Price 5s. net.

MR. HALL has again succeeded in producing a work which will appeal with equal force to the practical and to the scientific agriculturist, and will do much to overcome that innate prejudice of the ordinary practical farmer against science by showing him the enormous influence science has had in determining a rational system of manuring, and in giving him the knowledge of a variety of substances of use to him in his business of food production, as well as in securing for him a safeguard against adulteration by unscrupulous traders. In the history and evolution of the practice of keeping up the crop-producing power of the soil Mr. Hall examines critically the various theories of manuring adduced from time to time, and the experiments upon which they are based, and the study of merely this part of the work will be of supreme importance to the practical man and to the student in showing how experiments may be misconstrued and conclusions of the most erroneous description drawn.

The recommendations as to the manuring of farm crops are tempered with sound advice, and the impossibility of prescribing more than a generally suitable method of manuring without a careful study of soil and climatic conditions extending over some years

is well demonstrated. Mr. Hall gives some timely warnings as to deductions from field experiments, of which there has been such a plethora in recent years, with their unscientific methods both of carrying out and of deduction. The importance of taking into account the experimental error, which is estimated at ± 10 per cent., and of neglecting results within these limits should be taken to heart by all who carry on these so-called "experiments."

The chapter on farmyard manure is eminently practical and useful, and recent work on such subjects as root excretions, effect of fertilisers on tilth, and on residual values of manures, brings the book well up to date. It is sought to distinguish between manures and fertilisers, the former designating more or less complete plant foods, the latter those materials which supply one element in the plant food, nitrogen, potash, or phosphoric acid. The perversion of the meaning of the word manure from its original significance, hand work, is no less curious than the use of the word tillage to mean artificial manures, which use still persists in the eastern Midlands. The part of the work relating to lime is worthy of serious attention from all agriculturists, as it is probable that the lack of carbonate of lime in a soil is more often than any other cause an explanation of the comparative infertility or absence of satisfactory results from manuring. A chapter on the valuation and purchase of fertilisers puts this important method of calculation simply and accurately, and a concise statement of the Fertilisers and Feeding Stuffs Act will be useful to all users of manures.

Mr. Hall's remarks on the soil-inoculation question supplement and strengthen the advice he gave in his work on the soil, and the experiments on the new nitrogenous fertilisers, cyanamide and nitrate of lime, show the values of these fertilisers in terms of their competitors, nitrate of soda and sulphate of ammonia. The Rothamsted experiments are, of course, freely drawn upon to provide data, and in the hands of the present director of that station these results are being endowed with fresh life and excellently practical applications. The tables of results are concise and well arranged, so that the reader is not faced with an immense array of figures and tables, and bewildered without being enlightened. To sum up, this is a sound and scientific book which should be in the hands of every practical agriculturist as well as in those of the student, the teacher, and the manufacturer.

M: J. R. D.

THE NATURE OF ATTENTION.

Attention. By Prof. W. B. Pillsbury. Pp. x+346. (London: Swan Sonnenschein and Co., Ltd., 1908.) Price 10s. 6d. net.

IN 1906 Prof. Pillsbury published a book on attention in the "Bibliothèque internationale de Psychologie expérimentale." This work, with substantial additions, now appears in English as the latest volume of Prof. Muirhead's Library of Philosophy. It may be welcomed as a useful member of the series,